one of the places from which the buzzing sound proceeded it would cease, but would recommence again as soon as he withdrew two or three feet distant.

It is recorded that the "observer, on placing his hands close over the revolving cups of the anemometer where the electrical excitement was abundant, did not discover the slightest sensation of heat, but his hands instantly became aflame. On raising them and spreading his fingers, each of them became tipped with one or more cones of light nearly three inches in length. The flames issued from his fingers with a rushing noise, similar to that produced by blowing briskly against the end of the finger when placed lightly against the lips, and accompanied by a crackling sound. There was a feeling as of a current of vapour escaping, with a slight tingling sensation. The wristband of his woollen shirt, as soon as it became dampened, formed a fiery ring around his arm, while his moustache was electrified so as to make a veritable lantern of his face. The phenomenon was preceded by lightning and thunder, and was accompanied by a dense driving snow, and disappeared with the cessation of snow."

A few instances are given of convulsive muscular contraction caused by discharges. Thus, on June 23, 1887, whilst an observer was examining the iron joints around the station, from which the above-described hissing noise was proceeding, a strong electrical manifestation was felt by a twitching of the muscles of the face and hands. A violent "return shock" was experienced by the observer, who, on June 16, 1876, "whilst sitting on a rock, saw a blinding flash of lightning dart from a cloud seemingly not more than five hundred feet away, and heard a quick deafening report, and at the same time received a shock that jerked his extremities together as though by a most violent convulsion, and left lightning sensations in them for a quarter of an hour afterwards."

Among other effects previously noticed at considerable elevations above sea-level we find that on one occasion an observer felt a pain as if from a slight burn on both temples directly under the brass buttons of his cap; when he put his hands to the spots, there was a sharp crack, and all pain disappeared. A peculiar burning sensation was also often felt on the face and hands, and the scalp appeared to be pricked with hundreds of red-hot needles. A more intense action is recorded on June 9, 1882, when an observer was "raised off his feet by the action of the electricity passing through the top of his hat. Instantly snatching the hat from his head, he observed a beam of light as thick as a lead pencil, which seemed to pass through the hat, projecting about an inch on either side. and remaining visible for several seconds. The top of his hat was at least two inches from his head when this fiery lance pierced him. . . . He experienced a peculiar burning or stinging sensation of the scalp for several hours afterwards."

The telegraph wires and the buildings were struck by lightning on several occasions. When a flash struck the telegraph wire on July 19, 1884, for a moment the line resembled a belt of fire, and vibrated violently for some minutes after the discharge. Frequent discharges have also been observed between the ground wire and the rocks on which it rested.

On August 12, 1879, it is recorded:—"At 5.40 p.m. a bolt of lightning went through the arrester with the report of a rifle, throwing a ball of fire across the room against the stove and tin sheathing. At 6.35 p.m. the lightning struck the wire and building at the north end where the wires come through the window and arrester, with a crash equal to any 40-pounder. It burned every one of the four wires coming in at the window into small pieces, throwing them with great force in every direction, and filled the room with smoke from the burning gutta-percha insulation. The window-sash was splintered on the outside, one pane of glass broken, and another coated with melted copper. The anemometer wires were also burnt up, and the dial burned and blown to pieces." Barometer bulbs were cracked by lightning on August 21, 1881; and on August 15, 1886, it is recorded:—"Station struck by lightning at 6.45 p.m.; shattered the west window of the dining-room, breaking four panes of glass and shivering the casing, leaving an opening between the casing and the wall; also slightly damaged the building in several places, and set fire to some articles in the storehouse, and burned several holes in the side of a tin bucket, allowing the water in it to escape."

Again, on September 7, 1883, we read:—"Lightning struck the anemometer cups, burning a round hole about half an inch in diameter in one of them. The contact spring in the dial was badly bent, and the point of contact was considerably damaged by melting. When the insulated wire passed over a nail in the side of the house, the head of the nail was melted and the wire burnt off. Inside the window, at a bend in the wire, electricity passed off into the sill, setting some paper on fire. The paper covering the battery box was ignited. Three window lights were broken. A tourist in the dining-room was badly stunned. Observer in passing from dining-room to office was severely stunned by what seemed and felt like a blow on the head. One hand swelled rather badly. The report in the house was double, and sounded like striking red-hot iron upon which cold water had just been thrown."

Some interesting observations of hail-stones are also given. The stones are said to vary in size from peas to pigeons' eggs, and many of them were conical in shape. Sometimes they consisted of soft white snow throughout, without any nucleus, and at other times they were so hard as to require a heavy blow to break them. When this was the case, the broken hail-stones presented a stratified structure, with a centre of clear ice, and concentric rings of solid and spongy ice, with an outer covering of soft snow. It is noted that in all hail-storms the fall of hail entirely ceased for about half a minute following a heavy electric discharge; after this interval, however, the fall was considerably heavier than before.

The following observations, made on October 12, 1877, have an important bearing on the subject of hail formation:—"The rotatory movement of the hail cloud could be plainly seen, and with every violent flash of lightning the passing cloud would grow perceptibly darker, indicating increased condensation. The hail formed by this cloud must have fallen about three miles below, for the wood-packers reported quite solid hail at timber line, and none above. This verifies the theory that a hail cloud can be transported laterally several miles while the ice stones are forming."

The constant crackling of hail when it reaches the earth is also referred to, and rocks are said to give forth a peculiar chattering noise, as if they were shaken by subterranean convulsions, during the occurrence of heavy hail-storms.

These instances of inductive actions manifested during thunderstorms, electrical discharges, and their relation to hailstorms might be considerably multiplied. They confirm previous observations in an intense manner, and should be of some assistance to the student of meteorological phenomena.

R. A. Gregory.

NOTES.

The ordinary general meeting of the Institution of Mechanical Engineers will be held on Wednesday evening, October 29, and Thursday evening, October 30, at 25 Great George Street, Westminster, by permission of the Council of the Institution of Civil Engineers. The chair will be taken at half-past seven p.m. on each evening, by the President, Mr. Joseph Tomlinson. The following papers will be read and discussed, as far as time permits:—On tube-frame goods waggons of light weight and large capacity, and their effect upon the working expenses of railways, by Mr. M. R. Jefferds, of London (communicated through Mr. Henry J. Marten). In connection with this paper the members are invited to inspect one of the waggons which will be on view at any time during daylight on October 29 and 30, at the Victoria passenger station of the London, Chatham, and Dover Railway, where it will be standing in the siding behind the main arrival platform, by permission of the railway company. On milling cutters, by Mr. George Addy, of Sheffield. On the mechanical treatment of moulding sand, by Mr. Walter Bagshaw, of Batley.

THE annual general meeting of the Mineralogical Society will be held in the apartments of the Geological Society, Bnrlington House, Piccadilly, on Tuesday, November 11, at 8 p.m.

AN Exhibition, for the most part national, will be held at Lyons in 1892. With regard to electricity it will be international.

M. FLAHAULT, the eminent algologist and Professor of Botany at Montpellier, has been sent by the Minister of Public Instruction in France on a mission to Sweden, Norway, and Denmark, for the purpose of endeavouring to establish permanent relations between the Scandinavian Universities and the centres of higher instruction in France.

THE municipality of Verona gave a cordial reception to the Italian Botanical Society, which held its third annual Congress in that city from September 1–8. Prof. Arcangeli was elected President of the Society in the place of Prof. Caruel.

THE Vienna Academy commissioned Dr. G. Bukowski to make some geological investigations in Western Asia Minor at the beginning of the present year. After leaving the Khonas-Dagh, Dr. Bukowski made an excursion from Denisli to Tshoekelez-Dagh, the district lying to the north of the Tshuruksu Valley; from thence he proceeded over the Tshukur Pass to Jorengume, and over the Davas Ovassi table-land to the foot of the Baba-Dagh. At the end of June his researches were interrupted by ill-health.

THE Geologists' Association will open its winter session with a *conversazione*, which will be held in the Library of University College, Gower Street, on Friday, November 7. Many objects of geological interest will be exhibited on the occasion.

MR. JOHN HANCOCK, the well-known naturalist, died at his residence at Newcastle-on-Tyne on Saturday, at the age of 84. Mr. Hancock was an admirable observer of bird-life, and the Museum of the Natural History Society at Newcastle has profited largely by his knowledge and enthusiasm as an ornithologist.

THE death is announced, at the age of seventy-six, of Dr. Wenzel Leopold Gruber, the eminent Professor of Anatomy at the University of St. Petersburg.

THE first series of lectures provided by the Sunday Lecture Society begins on Sunday afternoon, October 19, in St. George's Hall, Langham Place, at 4 p.m., when Prof. Silvanus P. Thompson will lecture on "Waves of Light," with illustrations and experiments. Lectures will subsequently be given by Dr. B. W. Richardson, Mr. A. Elley Finch, Dr. Andrew Wilson, Mr. Willmott Dixon, Mr. Arthur Nicols, and Sir A. C. Lyall.

A SCIENTIFIC expedition, under the auspices of the Field Naturalists' Club of Victoria, will start on or about November 15 for the Eastern Islands. Its work will occupy from ten to fourteen days. The expedition will be divided into two parties, one of which will land on Deal Island, the other on Flinders Island. A sub-committee appointed to make the necessary arrangements has reported that while there is little information with regard to Deal Island, the utility of visiting one of the Kent group, which are small, lies in the possible opportunity of determining the limits of the strictly Tasmanian and Australian fauna and flora, since the islands lie considerably nearer the Victorian than the Tasmanian coast. The greater number of members will probably proceed to Flinders Island. They will, in all probability, be able to visit Barren Island, which lies close to the southern portion of Flinders Island. Two varieties of wallaby, waterfowl, and game of various kinds appear to be plentiful, and the nature of the country seems favourable for the pursuit of different branches of natural history.

THE October number of the *Kew Bulletin* begins with a paper on an edible fungus of New Zealand (*Hirneola polytricha*, Montagne). In order that the value of this fungus as an article of food might be tested, a supply of it was recently obtained for Kew. A portion of this supply was submitted for analysis to Prof. Church, F.R.S., and a note by him on the subject is printed in the *Bulletin*. Other subjects dealt with are Mexican Fibre or Istle, a forest plague in Bavaria (*Liparis Monacha*), okro fibre (*Hibiscus esculentus*, L.), cocoa-nut butter, and soil and cultivation in Yoruba-land.

IN the one hundred and third Annual Report of the Royal Botanic Garden, Calcutta, Dr. King says that the attention of the staff during the past year was devoted chiefly to the maintenance, in as high a state of efficiency as possible, of the various departments of the garden. Special attention was given to the herbarium, and a considerable number of new species were described. The sum of 1000 rupees having been granted in order that specimens might be obtained in Burma and Assam, Dr. King was enabled to do more than usual in these provinces. Under a recent order of the Government of India this exploration will be extended. An official document relating to Dr. King's Report, and issued by order of the Lieutenant-Governor of Bengal, contains the following passage:—"The control of Indian botanical operations has been centralized in the Calcutta Gardens, and the Superintendent has been appointed Director of the Botanical Survey of India. The grants promised by the Administrations of Burma and Assam will enable collections to be made on a larger scale and more continuously. As this work will constitute a separate Department, it has been ordered that in future years a separate Report should be submitted on the subject."

THE twenty-eighth Annual Report of the Government cinchona plantation and factory in British Sikkim, by Dr. King, has been issued. At the end of the financial year 1889–90 the plantation consisted of 4,682,401 trees of various ages, and of a nursery stock amounting to 264,000 seedlings. The crop collected during the year amounted to 304,705 pounds. The products of the factory were 1833⅓ pounds of sulphate of quinine, and 6578 pounds of febrifuge. The whole of the quinine and the greater part of the febrifuge were manufactured by the new fusel-oil process; and, as the arrangements for working this process were quite completed during the year, the old acid and alkali method of manufacture has now been definitively abandoned. An additional year's experience of the fusel-oil process confirms Dr. King's previously expressed opinion of its complete success. The quinine turned out by it is of excellent appearance and great purity, in the latter respect comparing favourably with most of the brands of the drug of European manufacture.

THE National Association for the Promotion of Technical and Secondary Education have issued some valuable "notes" on the working of the Technical Instruction Act; and a series of "suggestions" to County Councils and other local authorities on the use of the new fund allocated to County Councils for the purposes of technical and secondary education.

The greater part of the new number of the *Mineralogical Magazine* consists of a most careful and interesting paper, by Mr. L. Fletcher, on the Mexican meteorites, with especial regard to the supposed occurrence of wide-spread meteoritic showers. The number includes also the following papers, all of which are short:—A visit to the calcite quarry in Iceland, by J. L. Hoskyns-Abrahall; sanguinite, a new mineral, and Krennerite, by H. A. Miers; notes on Bowenite, or pseudo-jade from Afghanistan, by Major-General C. A. McMahon; on the relations between the gliding planes and the solution planes of augite, by Prof. J. W. Judd.

It is reported from India that Mr. John Eliott, Meteorological Reporter to the Government, starts this month on tour, and will first visit Quetta and then go down the Indus to Kurrachee and Bombay, and finally make his way to Calcutta.

We learn from *La Nature* that on September 21 Marseilles was visited by a severe thunderstorm accompanied by torrential rain and hail. The storm began about 6 a.m., and lasted 2½ hours. Everything that was in front of the shops was carried away, and the port was filled with *débris* of all kinds. Many of the hailstones were of the size of walnuts and even of fowl's eggs; several places were struck by lightning, and many animals were drowned. Such atmospheric disturbances are said to be very rare at Marseilles.

The Agricultural Department of Bohemia has published, in a quarto volume of 138 pages, the results of the rainfall observations made in that country during the year 1889, in continuation of the work formerly undertaken by the Hydrographic Committee, under the direction of Dr. Studnička. The stations now number 707; the rainfall is measured at 6 a.m. daily, and the amount set down to the previous day. For a large number of stations the daily rainfall is entered in the tables. The yearly results are shown upon a map, by means of reference numbers to the tables and curves for each 100 mm., and the various watersheds are also shown by red outlines. The tables show the number of wet days, and the maximum daily falls at each station. This rainfall service is now one of the most complete in Europe.

The Annual Report of the Director of the Royal Alfred Observatory, Mauritius, for the year 1888 shows that the temperature of the air was 0°·5 below the average of the last fourteen years, and below the average in every month except August and November. The greatest rainfall in one day was 4·5 inches, on March 19, on which day 1·3 inch fell in fifty minutes. The island has not been visited by a hurricane since March 21, 1879, but the Observatory continues its useful work of examining the logs of ships traversing the Indian Ocean, and synoptic charts have been prepared for eighteen days on which tropical cyclones were experienced. The upper clouds, when visible, generally travelled from the westward. The number of unusual sky glows was less than in 1887, but were observed in all months except September, October and December. There seems to be some connection between mortality from fever and rainfall; the maximum mortality occurs about two months after the maximum rainfall, and the minimum mortality about two months after the minimum rainfall. The report contains monthly rainfall values for eight stations, and results of the meteorological observations at Seychelles and Rodrigues.

Four interesting phenological maps of Finland appear in the *Meteorologische Zeitschrift* for September. In these, Dr. Ihne shows the date of flowering of *Ribes rubrum*, *Prunus padus*, *Syringa vulgaris*, and *Sorbus Aucuparia* in different parts of the country, by a series of zones, embracing each five days. *Ribes* and *Prunus* begin to flower earlier than the two others, and, accordingly, the zone for a given date is further north in the case of the former; their maps also present more zones. The isophanes (or lines of the same date of flowering), bordering the zones, are approximately parallel to the parallels of latitude. The regions from June 9 to 20 have more regular boundaries than those from May 26 to June 4, more equable weather having then set in. The presence of ice, and its cooling effect on water (even after melting), and so on wind, delays the time of flowering. Thus it is that islands and the land north-west of Lake Ladoga, &c., show retardation. The unequal breadth of the zones is remarkable; Dr. Ihne supposes the cause to lie in an irregular progression of the wave of heat, due to the arrangement of land and water.

A report from Nicaragua states that an earthquake occurred at Granada on September 30. No damage was done, nor did any volcanic eruption of the Mombacho take place.

A gigantic pendulum has been suspended from the centre of the second platform of the Eiffel Tower. It consists of a bronze wire, one hundred and fifteen metres long, with a steel globe weighing ninety kilogrammes at the end. The object is to demonstrate visibly the motion of the earth.

In the course of archæological explorations lately carried on in the Crimea, Prof. Vasselovski found painted human bones in two graves—six skeletons in one grave, and one in another. Prof. Grempler, of Breslau, is of opinion that these graves belonged to the original inhabitants of the Crimea, the Cimmerians of Herodotus. They laid their dead on elevated spots, so that the birds might consume the flesh. When quite bleached, the skeletons were painted with some mineral pigment. Several graves containing such painted skeletons have been found in Central Asia. Only three had been previously found in the Crimea.

We learn from the *Botanical Gazette* that the Cornell University Experiment Station is making a large and important collection of cultivated plants; collectors being sent to leading nurseries, and botanists employed in many parts of the country to collect the cultivated plants.

The rich algological herbarium collected by the late Prof. F. Hauck, of Trieste, has been purchased by Mme. Weber van der Bosse, of Amsterdam.

The *Victorian Naturalist* learns from Mr. Tisdall that the English foxglove has established itself on the slopes of the Stringer's Creek Valley, near Walhalla. Last season in some parts the banks were purple with them.

Nautilus shells are being picked up by fortunate hunters at Portland, Victoria. The *Portland Guardian* says the search after the shells is very keen, and that before daylight numbers of enthusiasts visit the beaches ready to prosecute their searches as soon as the morning breaks.

The Museum Committee of the Leicester Town Council, in their twelfth Report, just issued, are able to give a most satisfactory account of the institution under their charge. The building of the Town Museum has lately undergone extensive repairs, and many important additions have been made to the various departments. We may note that a very ingenious method for the exhibition of coins is in use. The pulling of a lever rotates a frame—containing cards in which the coins are inserted—in such a manner that the obverse and reverse, with a full description of each coin, are shown at the will of the observer. This method has been devised by Mr. Montagu Browne, the Curator.

A valuable paper, by Mr. E. Wilson, on fossil types in the Bristol Museum, has been reprinted from the *Geological Magazine* for August and September 1890. The Bristol Museum, it seems, contains 186 distinct fossil forms; and many of them "possess for the student of British palæontology a very high interest, not only on account of the remarkable nature of the fossils themselves, but also from the fact of their having been described by some of the most distinguished of palæontologists."

MESSRS. CASSELL AND CO. have issued Part 24 of their "New Popular Educator." It includes a coloured map of France.

FOUR new parts of the "Encyklopædie der Naturwissenschaften" (Breslau, E. Trewendt) have been issued. In Parts 58 and 59 of the second Abtheilung some important contributions are made to the dictionary of chemistry included in this great work. Parts 5 and 6 of the third Abtheilung contain portions of a hand-book of physics.

THE preliminary surveys for the projected Onega-White Sea Canal have been completed. The British Vice-Consul at Archangel in his last Report says that the following facts have been established. The level of the White Sea is about 15 feet higher than that of the Lake Onega; and the length of the proposed canal would be 219 versts, of which 129 versts are a natural waterway. The proposed measurements of the canal are—breadth, 63 feet; at the locks 112 feet; and along its other portions the proposed depth is 10 feet. The cost is estimated at about 7,500,000r. (£800,000), not including the expenses incurred in the construction of a port at a point on the coast of the White Sea. With the construction of the canal it is expected that the cost of transport of goods from St. Petersburg to Archangel will be diminished from 1r. per poud to 40c. The canal will afford every facility for the transport of fish from the plentiful fishing-grounds of the White Sea to St. Petersburg, and also for the transport of the mining products of Olonets. It will also be of great strategical importance in connecting St. Petersburg and Cronstadt with the White Sea. There can be no doubt, the Vice-Consul thinks, that, considering the unlimited supply of timber in the province of Olonets, and the enterprising character of the population, shipbuilding will be carried on on a large scale when the canal is constructed.

IF we were to judge by statistics alone, we should be forced to conclude that the present system of granting rewards for the destruction of wild animals in India has had little or no effect in diminishing their numbers or in decreasing the mortality caused by them. This conclusion, however, would not be in accordance with facts. The methods according to which the statistics are collected have been so much improved that no induction can safely be made from the figures available. This is pointed out in a recent Report of the Revenue Department of the Government of Madras. The Report continues:—"The experience of almost every District officer who has been some years in the country would be that the number of destructive wild animals had largely decreased with the advance of cultivation and the progress of railways, and the evidence of natives would probably be the same. There are parts of the country still where, owing to the existence of forest and difficulty of access, wild animals of prey continue to exist in large numbers, and it is the case that, owing to various causes, Europeans at all events do less now in the way of killing large game than formerly was the case. They have less time to spare from their official duties, and less money to spend. It can hardly, however, be doubted that, owing to the existence of the system of granting rewards for animals slain, native shikaris are encouraged to maintain a profession which otherwise probably they would give up from want of support, and for this reason, if for no other, the Board would not wish to see at present any change made in the system of granting rewards. It may be hoped that the construction of the East Coast Railway, and the branch from it through the heart of the Vizagapatam district to the Central Provinces, will tend in a great measure to reduce the number of wild animals in the districts where they now do very considerable damage. Cultivation and population in tracts now given up to jungle and grass will increase largely, and the need of wood for the railways will lead probably to the destruction of large areas of jungles, which now exist in tracts which should be devoted to agriculture."

NATURALISTS will read with interest a paper in *Humboldt* for September, in which Prof. Forel, of Zürich, gives the results of a visit he lately paid to Tunis and Eastern Algeria, chiefly to observe the ants there. Looking from a ship at the dreary grey wastes, and the large date-palm oasis of Gabes, one fancies all animal life must be concentrated under the palms. But really there is very little of it there, and hardly anything singular; while the sand of the desert contains, round each of the poor, small, sparse plants, a host of beetles and other insects, many of them with striking adaptations and peculiarities. Some live on excrement of camels, asses, &c., some on the plants, and some prey on other animals, big and small. In one ant-hill he found that several ants had a small brown object clinging to the lower part of an antenna; in some cases, one on either antenna. On examination, this fell off, and was found to be a small beetle, which evidently clings there as guest; it has tufts of hair, which are probably licked by the ant. The host did not seem to trouble itself about this little creature, which, by its odd post, is enabled to accompany the ant in its wanderings and changes of abode. Prof. Forel remarks on the peaceful character of the ants in that region; with few exceptions they avoid fighting, and only one ant was found capable of piercing the human skin.

THE phenomenon of globular lightning was imitated by M. Planté, it will be remembered, with his secondary batteries. It has been recently shown by Herr von Lepel (*Met. Zeits.*) that this can also be done with so-called statical electricity, obtained from an influence-machine. Two thin brass-wire points from the poles of a powerful machine being held at a certain distance from the opposite sides of an insulated plate of mica, ebonite, glass, or the like, there appear small red luminous balls, which move about, now quickly, now slowly, and are sometimes still. Even better effects were had with a glass or paper disk which had been sprayed with paraffin. Small particles of liquid or dust seem to be the carriers of the light. A slight air-current makes the spherules disappear with hissing noise. These spherules, the author remarks, are phenomena of weak tension; an increase of the tension gives a rose spark-discharge. Various interesting analogies with globular lightning are traced.

IN a long series of articles a native Japanese paper gives some interesting figures about the students of Tokio. There are 107,312 students in the whole Empire in the various colleges and other high schools (primary schools and ordinary middle schools excepted). Of this number, 38,114 represent students prosecuting their studies in the capital—that is to say, about 40 per cent. of the whole number are congregated in Tokio. Among the 38,114 students, 6,899 are domiciled in Tokio, so that the number of those coming from other localities is 31,215. The amounts which individual students spend vary from seven or eight dollars to about fifteen dollars per month. Taking the average, it may be assumed that each student spends ten dollars a month, or 120 dollars a year. Thus the total amount of money annually disbursed by these lads is a little over 3,700,000 dollars. In other words, money aggregating over three millions and a half is being yearly drawn from the provinces to the capital through this channel. The provinces receive little in return, for few of the students ever go back to their homes, their sole ambition being to remain in the capital, and there rise to eminence in some walk of life.

THE British Consul at St. Jago de Cuba, in his latest Report, refers to the disease in the cocoa-nut plantations there, and the result of the investigations into the pest made by the Academy of Sciences of Havanna. Their Report attributed the disease to a microscopic fungus of the genus *Uredo*, and stated that the only remedy was to cut down and burn all the trees attacked. Dr. Galves, however, endeavoured at the time to convince the Academy that this was an error, and that the disease proceeded from an hemipterous insect of the genus *Coccus*, which he classified as *Diaspis vandalicus*, and afterwards Dr. Valdés Dominguez, of Baracoa, confirmed this opinion. Finally, at the end of last year, Dr. Carlos de la Torre, a member of the Academy, set all doubt at rest, and proved that the *Uredo* referred to by the Commission did not even exist in the cocoa-nut trees, and that the small stains which had been mistaken for it were normal to the plant, and existed both in the healthy and attacked trees, and that the real cause was the *Diaspis vandalicus* of Galves, together with three other species of *Coccus*. The first symptom of the disease is the appearance on the under side of the leaflets of the fronds, of small white stains, almost imperceptible. These soon attain the size of a pepper-corn, and impart a general white colour to the leaflets, which change, later on, to yellow, and finally dry up.

THE additions to the Zoological Society's Gardens during the past week include two Black-eared Marmosets (*Hapale penicillata*) from South-East Brazil, presented by Captain C. Crawford-Caffier, R.N.; an African Civet Cat (*Viverra civetta*), a Two-spotted Paradoxure (*Nandinia binotata*) from West Africa, presented by Lieut.-Colonel W. Gordon Pachett, W.I.R.; a Serval (*Felis serval*) from West Africa, presented by Mr. J. H. Cheetham, F.Z.S.; two Long-fronted Gerbilles (*Gerbillus longifrons* ♂ ♀) from Western Asia, presented by Mrs. F. A. Kitchener; two Blackcaps (*Sylvia atricapilla*), a Garden Warbler (*Sylvia hortensis*), British, presented by Mr. J. Young, F.Z.S.; three Passerine Parrots (*Psittacula passerina*) from Brazil, presented by Mr. Arthur Robottom; a Barnard's Parrakeet (*Platycercus barnardi*) from Australia, presented by Mrs. E. M. Temple; a Golden Eagle (*Aquila chrysaëtus*) from Morocco, presented by Mr. Charles A. Payton; a Snowy Egret (*Ardea candidissima*) from America, presented by Mr. H. H. Sharland; a Herring Gull (*Larus argentatus*), three Lesser Black-backed Gulls (*Larus fuscus*), British, presented by the Hon. J. S. Gathorne Hardy, M.P., F.Z.S.; two Purple Porphyrios (*Porphyrio cæruleus*) from Sicily, presented by Mr. J. I. S. Whitaker; a Common Chameleon (*Chamæleon vulgaris*) from North Africa, presented by Mrs. Wanklyn; two North African Jackals (*Canis anthus*) from North Africa, deposited; two Philantomba Antelopes (*Cephalophus maxwelli* ♂ ♀) from South Africa, three Passerine Parrots (*Psittacula passerina*) from Brazil, a Lucian's Parrakeet (*Palæornis luciania* ♂) from China, purchased; six Esquimaux Dogs (*Canis familiaris* var. 4 ♂ 2 ♀), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

OBJECTS FOR THE SPECTROSCOPE.

Sidereal Time at Greenwich at 10 p.m. on October 16 = 23h. 41m. 28s.

Name.	Mag.	Colour.	R.A. 1890.	Decl. 1890.
			h. m. s.	° ′
(1) G.C. 4940	—	—	23 15 9	+ 7 28
(2) G.C. 4964	—	Bluish-green.	23 20 36	+41 47
(3) 280 Schj.	8	Very red.	23 55 39	+59 44
(4) ψ_1 Aquarii	4·5	Whitish-yellow.	23 9 34	− 9 45
(5) ψ_3 Aquarii	5·5	White.	23 12 43	−10 16
(6) V Tauri	Var.	Reddish.	4 45 40	+17 21
(7) R Tauri	Var.	Very red.	4 22 16	+ 9 55
(8) R Lyræ	Var.	Red.	18 52 0	+43 48

Remarks.

(1) The spectrum of this nebula has not yet been recorded. It is described as "considerably bright; pretty small; round; pretty suddenly brighter in the middle."

(2) This remarkable planetary nebula was stated by Lassell to be bi-annular, consisting of a nucleus and two rings, whilst Lord Rosse observed a spiral structure. Herschel described it as "a very remarkable planetary nebula; very bright; pretty small; round; blue." The spectrum is also a remarkable one, consisting of the three ordinary lines of the nebulæ, and, in addition, a line near wave-length 470, which was first seen by Dr. Huggins. This line occurs only in this nebula, with the exception of the Orion nebula, where it has been recorded by Mr. Taylor, and is also feebly impressed in Mr. Lockyer's photograph of the spectrum. It is, however, far brighter in the planetary nebula than in the Orion nebula. It has been suggested that the line is really the blue band of carbon under such conditions that most of the light is concentrated at about wave-length 470, as is sometimes the case in the laboratory. If this be so, it ought not to be so sharply defined as the other lines, and an observation should be made with reference to this point. Other lines, especially near the carbon flutings in the green, should also be looked for.

(3) The spectrum of this star, according to the observations of Dunér, is undoubtedly a banded one, but whether it is one of Group II. or Group VI. is doubtful. The strongest band is in the red, and this is very little degraded. In the green there is another band, which is wider but not so strong. With less certainty other bands were detected in the red and yellow-green, and another "very vaguely" in the blue. The spectrum is well worth further investigation, as we are likely to learn most by a study of the apparent departures from the regular types.

(4) A star of the solar type, with fine lines (Konkoly). The spectrum should be further examined as to whether the temperature is increasing (Group III.) or decreasing (Group V.). The fineness of the lines tend to show that it is the latter.

(5) A star of Group IV. (Konkoly).

(6) The spectrum of this variable, according to Gore's Catalogue, has yet to be determined, and the forthcoming maximum of October 19 may therefore be taken advantage of. The period is about 169 days, and the magnitude ranges from 8·3–9·0 at maximum to $<$ 12·8 at minimum.

(7) This variable of Group II. will reach a maximum about October 21. The period is about 326 days, and the variation from 7·4–9·0 at maximum to $<$ 13 at minimum. Bright lines and carbon flutings should be looked for.

(8) This well-known variable of Group II. will reach a maximum about October 24. The range is small (4·3–4·6) and the period short (46 days), two conditions which appear to go together, exactly as is demanded by the collision theory of this kind of variability. Further, if that explanation be correct, it is not likely that bright lines will appear at maximum, and this may be made a test observation.

A. FOWLER.

THEORY OF SOLAR RADIATION.—Mr. W. Goff has written a pamphlet in which he propounds a theory of the sun's radiation of heat. It is well known that geologists and physicists demand a much longer duration of the sun's past activity than the present estimate of the expenditure of heat would allow, supposing that there have been no unknown means of supply. Dr. Croll, in "Stellar Evolution," brings forward evidence in support of the longer periods. To account for the great disparity that exists between the results arrived at from different points of view, he assumed that the primitive nebulous mass possessed a store of energy derived from the impact of two large cold bodies moving with enormous velocities. Mr. Goff also thinks that the grounds upon which geologists and biologists found their conclusions are more certain and trustworthy than those of the physicist. He does not, however, supplement gravitational energy by energy derived from other sources, in order to account for the sun's outlay, but shows that the methods adopted for arriving at values of the amount are at fault. In his words:—"Radiant energy is a very different thing from absorbed heat, and I have endeavoured to demonstrate that its value must be considerably less. Also I have shown that the current estimates of the sun's annual loss of heat are founded entirely on an absorbed heat basis. They must, consequently, if my arguments are correct, be far in excess of what his expenditure actually is." The distinction between radiant energy and absorbed heat is clearly indicated, and it is evident that, unless the value of each is the same, the present determinations of the sun's emission of heat must be incorrect.

THE SATELLITES OF SATURN.—The micrometer measures of the satellites of Saturn made by Dr. Hermann Struve with the 30-inch Pulkova equatorial, has led to some interesting and im-